DRAKE

TR-22

2 METER FM TRANSCEIVER

Instruction Manual

STANDARD WARRANTY

R. L. DRAKE COMPANY warrants each new radio product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit of its manufacture which under normal installation, use, and service discloses such defect, provided the unit is delivered by the owner to us or to our authorized radio dealer or wholesaler from whom purchased, intact, for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to original purchaser and provided that such examination discloses in our judgement that it is thus defective. Should a malfunction be suspected, write in detail to our Service Department for suggestions concerning the operation, repair or return of your unit if it should prove necessary.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor extend to units which have been repaired or altered outside our factory, nor in cases where the serial number thereof has been removed, defaced or changed, nor to units used with accessories not manufactured or recommended by us.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our radio products.

The R. L. DRAKE COMPANY reserves the right to make any improvements to its products which it may deem desirable without obligating itself to install such improvements in its previously manufactured products.

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R.L.DRAKE COMPANY, 540 Richard Street, Miamisburg, Ohio 45342
Customer Service Dept. Phone 513-866-3211**********

1. GENERAL DESCRIPTION

1.1 FEATURES

The TR-22 is a 2 meter VHF-FM transceiver with a capacity for 6 channels and will operate from an external 12 V DC source or from its internal rechargeable nickle cadmium batteries. A 120 V AC 50-60 Hz battery charger is built into the TR-22.

1.2 SPECIFICATIONS

1.2.1 GENERAL

Frequency Coverage: 144 - 148 MHz

Number of Channels: 6 channels, 3 supplied.

	Channel 1	Channel 2	Channel 3
Receive:	146.94 MHz	146.94 MHz	146.76 MHz
Transmit:	146.34 MHz	146.94 MHz	146.34 MHz

Transmitter Control: Push-to-talk

Power Drain: D.C.
Receive: 45 mA squelched
Transmit: 450 mA

Power Source: 13 V DC ± 20%
120 V AC 50-60 Hz (for recharging nickle cadmium batteries only).

Dimensions: 5-3/8" x 2-5/16" x 7-1/8"

Weight: 3-3/4 pounds

Accessories Supplied: Dynamic microphone,
Over-the-Shoulder carrying case,
120 V AC and 12 V DC power cord,
Speaker plug, and
Ten (10) nickle cadmium batteries.

1.2.2 RECEIVER

Receiver Circuit:	Completely transistorized crystal controlled double conversion superheterodyne.	
1st IF Frequency:	10.7	MHz
2nd IF Frequency:	455	kHz
Antenna Input Impedance:	50	Ohms
Sensitivity:	0.5	Microvolt or less for 20 dB quieting.
Selectivity:	20	kHz at - 6 dB
Modulation Acceptance:	± 7	kHz
Audio Output:	0.7	Watt at 10% or less distortion.

1.2.3 TRANSMITTER

R.F. Output Power:	1	Watt (conservative)
Frequency Deviation:	Adjustable to ± 10 kHz maximum Factory set to ± 5 kHz	

2. INSTALLATION

2.1 UNPACKING

Carefully remove the TR-22 Transceiver from its carton and examine it closely for signs of shipping damage. Should any be apparent, notify the delivering carrier immediately, stating the full extent of the damage.

Fill out and mail the enclosed registration card so that your warranty will be effective.

Save the packing material. You may need it later for reshipment or storage. Inspect the packing material closely before putting it away to be sure you have not overlooked the accessories packed with the unit.

2.2 LOCATION

In general, the location of the TR-22 is not cricical. However, extremely hot locations, such as near radiators or heating units, or on top of other radio equipment should be avoided.

2.3 ANTENNA REQUIREMENTS

The TR-22 has a self contained antenna. It should be extended to its full length for proper operation. An external antenna connector is provided on the rear of the TR-22. External antennas should be resonant at the operating frequency and present an impedance of 50 ohms. The self contained antenna should be retracted whenever external antennas are in use.

2.4 POWER REQUIREMENTS

The TR-22 is supplied with rechargeable nickle cadmium batteries for portable operation. It is also possible to operate the TR-22 from eight size AA carbon zinc dry cells. A DC power plug is provided for operating on an external 12 V DC source. This plug plugs into the connector on the rear of the TR-22 just below the external antenna connector. When the DC power plug is in use, the internal batteries are disconnected. The 120 V AC power cord and rear connector are provided for charging the nickle cadmium batteries. Operation from the 120 V AC charger is not recommended.

2.5 SPEAKER AND HEADPHONE REQUIREMENTS

The TR-22 has a built-in speaker. An external 8 ohm headphone or speaker may be plugged in the miniature phone jack located on the front panel just above the microphone jack. Plugging an external speaker or headphone into this jack turns off the built-in speaker.

2.6 MICROPHONE REQUIREMENTS

A 500 ohm dynamic microphone with a push-to-talk switch is supplied with the TR-22.

3. CONTROL FUNCTIONS

3.1 FRONT PANEL CONTROLS

3.1.1 ON-OFF SWITCH AND VOLUME CONTROL

The ON-OFF switch and VOLUME control are combined in the lower left control. Clockwise rotation turns the TR-22 on and increases audio gain.

3.1.2 SQUELCH AND BATTERY CHECK CONTROL

The SQUELCH and BATTERY CHECK control is located directly beneath the meter. Full counterclockwise rotation will operate the battery check switch and the battery voltage will be indicated on the meter. Clockwise rotation of this control increases the signal level required to defeat the squelch circuit and allow reception.

3.1.3 CHANNEL SELECTOR

The large knob in the approximate center of the TR-22 selects one of six possible transmit and receive crystal pairs.

3.2 INTERNAL CONTROLS

3.2.1 DEVIATION CONTROL

Frequency deviation is factory set to $\pm$ 5 kHz. Greater deviation than this can be obtained by adjusting VR 2 1 on the transmitter circuit board. Remove the case by releasing the two captive snap buttons on the case rear at both corners. Remove the plastic cover by first removing the two flat berylium copper springs on each side of the chassis. With the TR-22 upside down and front panel facing you, VR 2 1 is located 2 inches behind the squelch control and the designation "VR 2 1" is printed on the circuit board. Frequency deviation increases when the slider of VR2 1 is moved towards the rear of the TR-22. Use a screwdriver with an insulated shaft and handle for this adjustment. Replace the plastic cover and flat springs.

3.2.2 TRANSMITTER FREQUENCY ADJUSTMENT

With the front panel facing you and the TR-22 upside down, the transmitter crystals correspond to the channel numbers and are numbered from the extreme left to the right, 1 through 6. The bank of trimmer capacitors in back of the transmit crystal sockets allow transmit frequency adjustment left to right, channels 1 through 6.

3.2.3 RECEIVER FREQUENCY ADJUSTMENT

There are no provisions for receiver frequency adjustment. Receiver crystals must necessarily have a low frequency tolerance of .001%.

3.2.4 S-METER SENSITIVITY ADJUSTMENT

The S-meter response sensitivity is determined by the trim pot VR2 on the receiver circuit board. With the front panel facing you and the TR-22 upright, VR2 is located at the right, close to the front panel. Apply a 100 microvolt signal to the TR-22 antenna on 146.76 MHz and adjust VR2 for full scale meter deflection. Use a screwdriver with an insulated shaft and handle for this adjustment.

3.2.5 RELATIVE RF OUTPUT METER ADJUSTMENT

The RF Output Meter response sensitivity is determined by the trim pot VR23 on the transmitter circuit board. With the front panel facing you and the TR-22 upside down, VR23 is located immediately behind the left two transmitter trimmer capacitors. While transmitting into a 50 ohm dummy load, adjust V23 for a reading of 8 on the RF output meter. Use a screwdriver with an insulated shaft and handle for this adjustment. In normal use, if the RF output goes into the red region, check for low batteries.

3.2.6 BATTERY CHECK METER ADJUSTMENT

The Battery Check meter response sensitivity is determined by the trim pot VR22 on the transmitter circuit board. With the front panel facing you and the TR-22 upside down, VR22 is located at the right rear of the circuit board. With 10.0 volts applied to the DC power cord, turn the TR-22 on and rotate the squelch control fully counterclockwise into the "B.CH" (Battery Check) position and set VR22 so that the battery check meter needle covers the blank space between the red and black sectors on the meter face. Use a screwdriver with an insulated shaft and handle for this adjustment.

4. OPERATION

4.1 OPERATION WITH INTERNAL NICKLE-CADMIUM BATTERIES

The TR-22 is shipped with ten ni-cad batteries. These batteries should be inserted into one 4 cell and one 6 cell holder supplied, and installed in the TR-22. The batteries should be charged before using the TR-22. Charging is performed by plugging the AC cord supplied into the rear of the TR-22 and into a 120 V AC outlet. The batteries should be charged whenever the battery check meter needle reaches the right edge of the red scale. Battery condition may be checked by turning the TR-22 on and rotating the squelch control fully counter-clockwise into the "B.CH" (Battery Check) position. Battery condition should be checked each time before using the TR-22 and operation suspended if the battery condition is not within the black scale. Do not charge the batteries longer than 16 hours. Do not completely discharge the batteries (below 5 on the meter scale) because if discharged too far, the weakest cell in the string may reverse polarity and become permanently damaged. The TR-22 must be turned off in order for the batteries to take a charge. Transmitting while charging will result in hum on the transmitted signal and the batteries will be further discharged because the charger can supply only 45 mA while 450 mA is required for transmitting. The receiver draws 45 mA squelched. Therefore no battery condition improvement can be expected while simultaneously charging and receiving. Charging while receiving is not recommended.

The TR-22 is operated by turning the ON-OFF switch ON, extending the built-in antenna and rotating the SQUELCH control clockwise until the receiver is muted. A channel with no stations transmitting must be selected in order to set the squelch control. An external antenna may be plugged into the connector on the rear of the TR-22. When using an external antenna, the built-in antenna must be retracted. Do not transmit on the TR-22 when no external antenna is connected and with the built-in antenna retracted. The TR-22 transmits when the button on the microphone supplied is depressed.

4.2 OPERATION WITH DRY CELL BATTERIES

The TR-22 is supplied with an extra 4 cell battery holder so that it may be operated from penlite dry cells. Remove all of the Ni-Cad batteries. Fill both four cell battery holders with dry cells and install the 8 dry cell batteries in the TR-22. Do not use more than 8 dry cells. Do not charge the dry cells with the TR-22 charger. Do not leave discharged dry cells in the TR-22. Do not store the TR-22 for long periods with dry cells installed and use only leak proof dry cells in the TR-22.

The TR-22 may be operated as described in the second paragraph of 4.1.

4.3 OPERATION WITH ALKALINE BATTERIES

Alkaline batteries may be used in the TR-22. A new set of alkaline batteries may last up to four times as long as one charge on Ni-Cad batteries. Alkaline batteries are very useful for operating the TR-22 when away from a source of power to recharge the Ni-Cad batteries. Only 8 alkaline batteries are required and these should be installed in the two 4 cell battery holders supplied with the TR-22.

The alkaline batteries should not be recharged unless the battery manufacturer states that they are rechargeable.

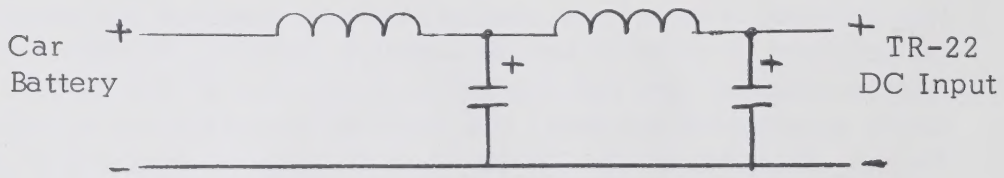
The TR-22 may be operated as described in the second paragraph of 4.1.

4.4 A.C. OPERATION

A.C. operation of the TR-22 may be accomplished only by use of a 12.5 V DC power supply powered from 120 V AC. This supply should have good voltage regulation and be capable of delivering 500 mA. Connection to the TR-22 should be made at the D.C. cord supplied.

4.5 AUTO GENERATOR/ALTERNATOR NOISE

Some automobile electrical systems are not sufficiently filtered and a slight buzz in the TR-22 signal may be reported when operating mobile from the auto battery. An external filter shown below will correct the situation. The RF chokes and capacitors are available from the R. L. Drake Company at $ 1.75 for each component.



Capacitors - 1000 ufd @ 15 V or more,
Chokes - 1 mH or more @ 1/2 amp.

4.6 OPERATION WITH AN EXTERNAL D.C. SOURCE

The TR-22 may be operated from an external 13 volt ± 20% source by plugging the D.C. cable supplied into the D.C. connector on the rear of the TR-22. The wire with the gray stripe is the positive lead. The internal batteries may be charged from AC while the D.C. plug is installed. The internal batteries cannot be charged from the external D.C. source.

5. TRANSMIT AND RECEIVE CRYSTALS

5.1 INSTALLATION

5.1.1 INSTALLING TRANSMIT CRYSTALS

With the front panel facing you and the TR-22 upside down, transmitter crystals correspond to the channel numbers and are numbered extreme left to right, 1 through 6. Crystals should be adjusted on frequency before operating. (See 3.2.2).

5.1.2 INSTALLING RECEIVE CRYSTALS

With the front panel facing you and the TR-22 upside down, receiver crystals correspond to the channel numbers and are numbered extreme right to left, 1 through 6.

5.1.3 TRANSMIT CRYSTAL JUMPERS

One transmit crystal can be used on several channels by connecting a jumper wire from the terminal lug in front of the transmit crystal to the lug of the channel that is desired to be repeated. With the front panel facing you and the TR-22 upside down, the terminal lugs correspond to the channel numbers and are numbered extreme left to right, 1 through 6.

5.1.4 RECEIVE CRYSTAL JUMPERS

One receive crystal can be used on several channels by connecting a jumper wire from the terminal lug in front of the receive crystal to the lug of the channel that is desired to be repeated. With the front panel facing you and the TR-22 upside down, the terminal lugs correspond to the channel numbers and are numbered extreme right to left, 1 through 6.

5.2 CRYSTAL ORDERING INFORMATION

Accessory channel crystals may be ordered from the R. L. Drake Company. To order, specify the desired receive and transmit frequency and indicate that they are for the TR-22. Due to critical TR-22 crystal requirements, we recommend ordering crystals only from the R. L. Drake Company.

If you desire to order crystals from another source, the following information should accompany your order:

Transmit Crystals

Fundamental mode parallel resonant with 42 pF load capacity in HC-25/U plug-in holder, and $\pm$ .003% frequency tolerance.

Divide transmit frequency by 12 to obtain crystal frequency.

5.2 CRYSTAL ORDERING INFORMATION (continued)

Receive Crystals

Parallel resonant, 3rd overtone mode with 35 pF load capacity in HC-25/U plug-in holder and ± .001% frequency tolerance or less.

$$\text{Crystal frequency} = \frac{(\text{Operating frequency in MHz} - 10.7\ \text{MHz})}{3}$$

6. TROUBLE SHOOTING

Careful consideration has been given in the design and testing of the TR-22 to keep maintenance problems to a minimum.

If you experience difficulty, we recommend that you return the TR-22 to your Drake dealer or write direct to our Customer Service Department and describe your problem in detail.

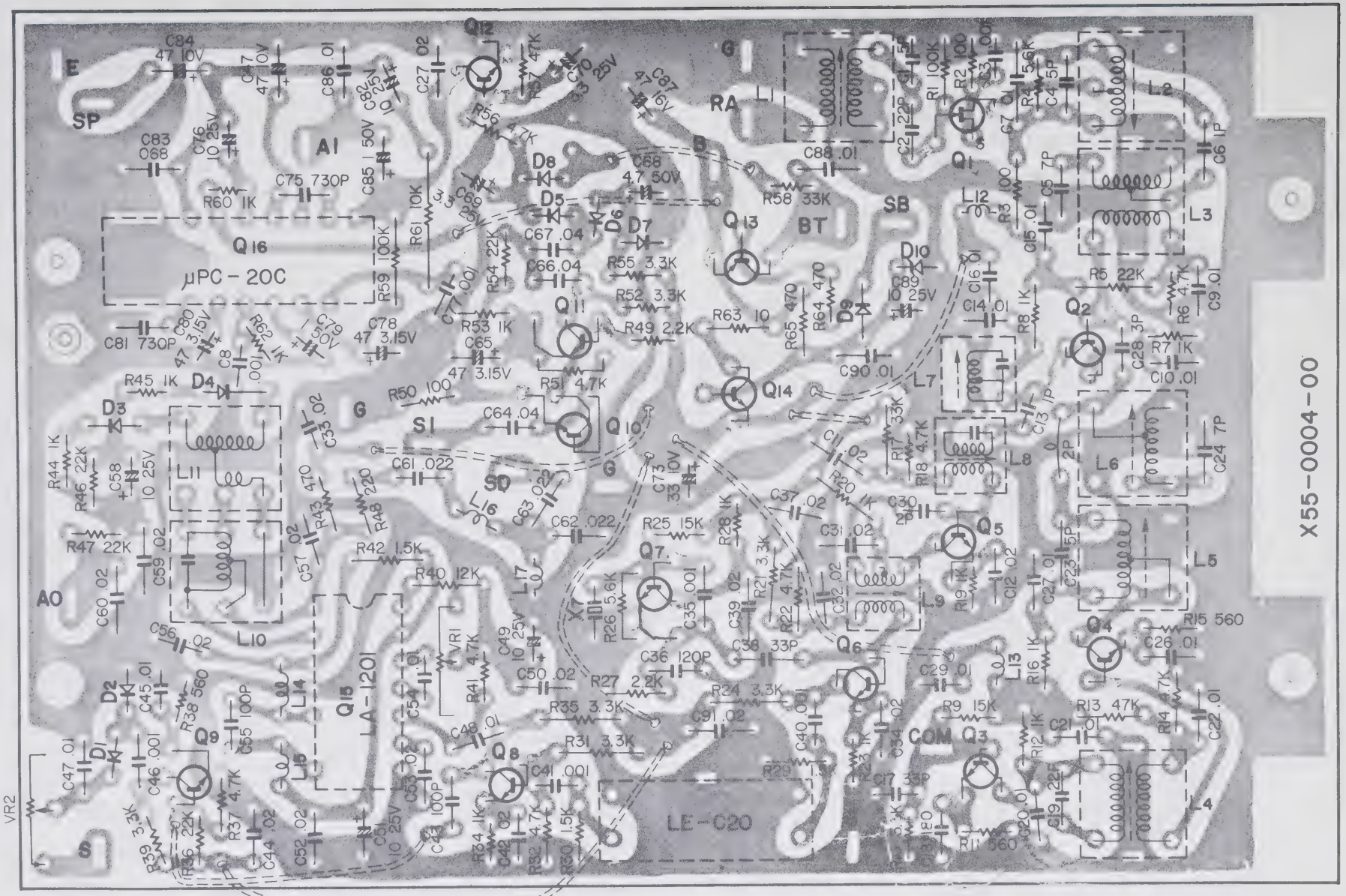
DO NOT RETURN EQUIPMENT TO THE FACTORY WITHOUT PRIOR AUTHORIZATION !

The high component density and small circuit board size of the TR-22 necessitates extreme care and a high level of competency in the repair of this unit. We highly recommend all repair work be performed by our service department. Please note that our warranty is void if unauthorized repair work is performed on the TR-22.

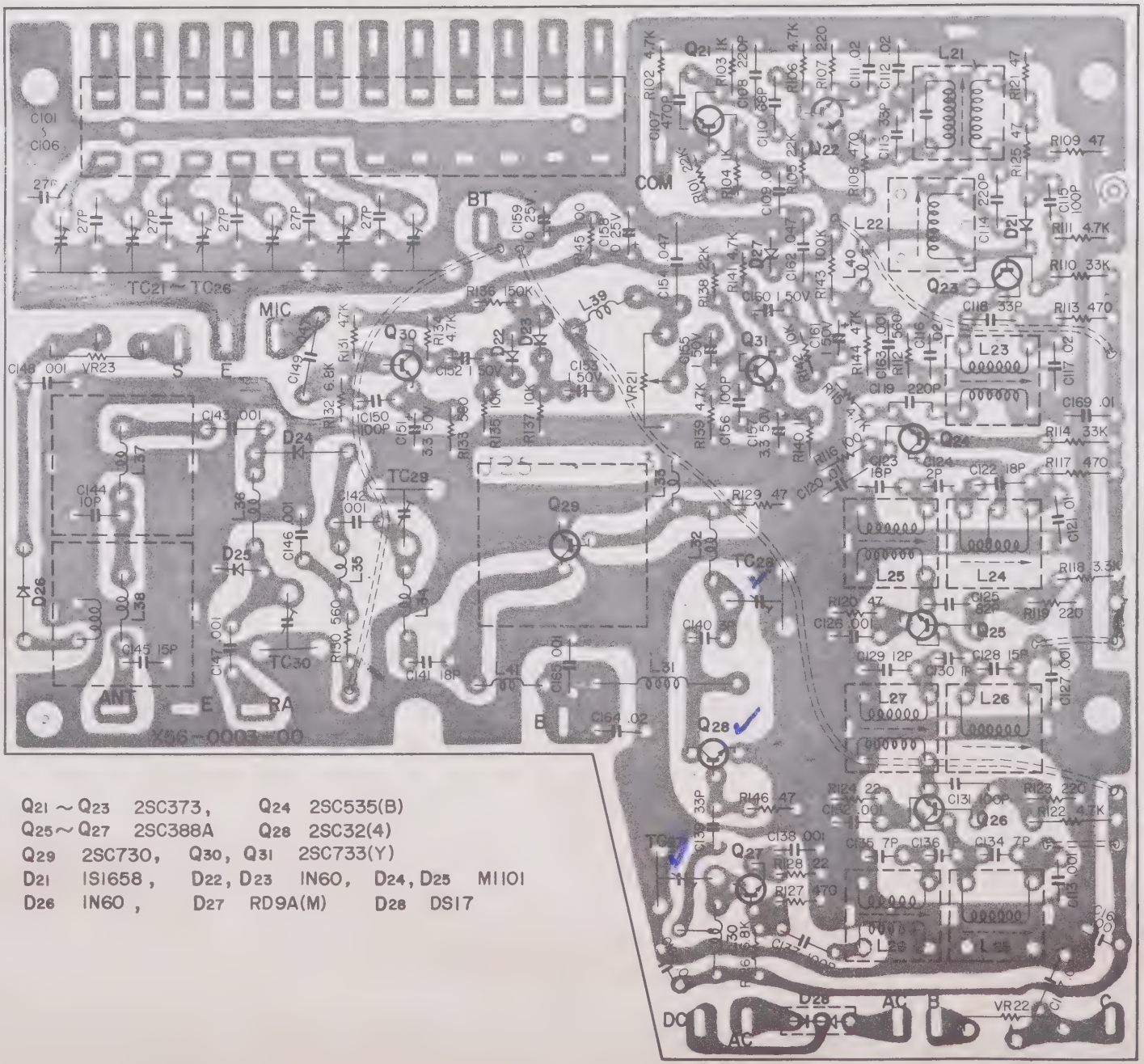
7.

TR-22 VOLTAGE CHART

	Base or Gate	Emitter or Source	Collector or Drain
Q1	0	0.7	6.2
2	1.1	0.5	6.5
3	1.1	0.6	6.0
4	0.6	0.6	6.0
5	0.8	0.2	6.8
6	0.8	0.3	6.4
7	1.8	1.2	6.4
8	0.9	0.3	6.4
9	1.2	0.6	4.0
10	1.0	0.3	1.6
11	1.6	1.0	4.5
12	0.5	0	0.8
13	7.0	12.0	12.0
14	7.0	8.1	11.8
15	Refer to circuit diagram for IC voltages		
16	Refer to circuit diagram for IC voltages		
21	1.3	0.9	7.5
22	1.3	0.7	6.7
23	0.8	0.6	10.9
24	0.4	0.6	8.9
25	0.5	0.5	11.5
26	0.3	0.8	11.6
27	0.4	0.1	11.6
28	--	0	11.6
29	--	0	11.6
30	0.4	0.4	3.9
31	1.3	1.2	3.8



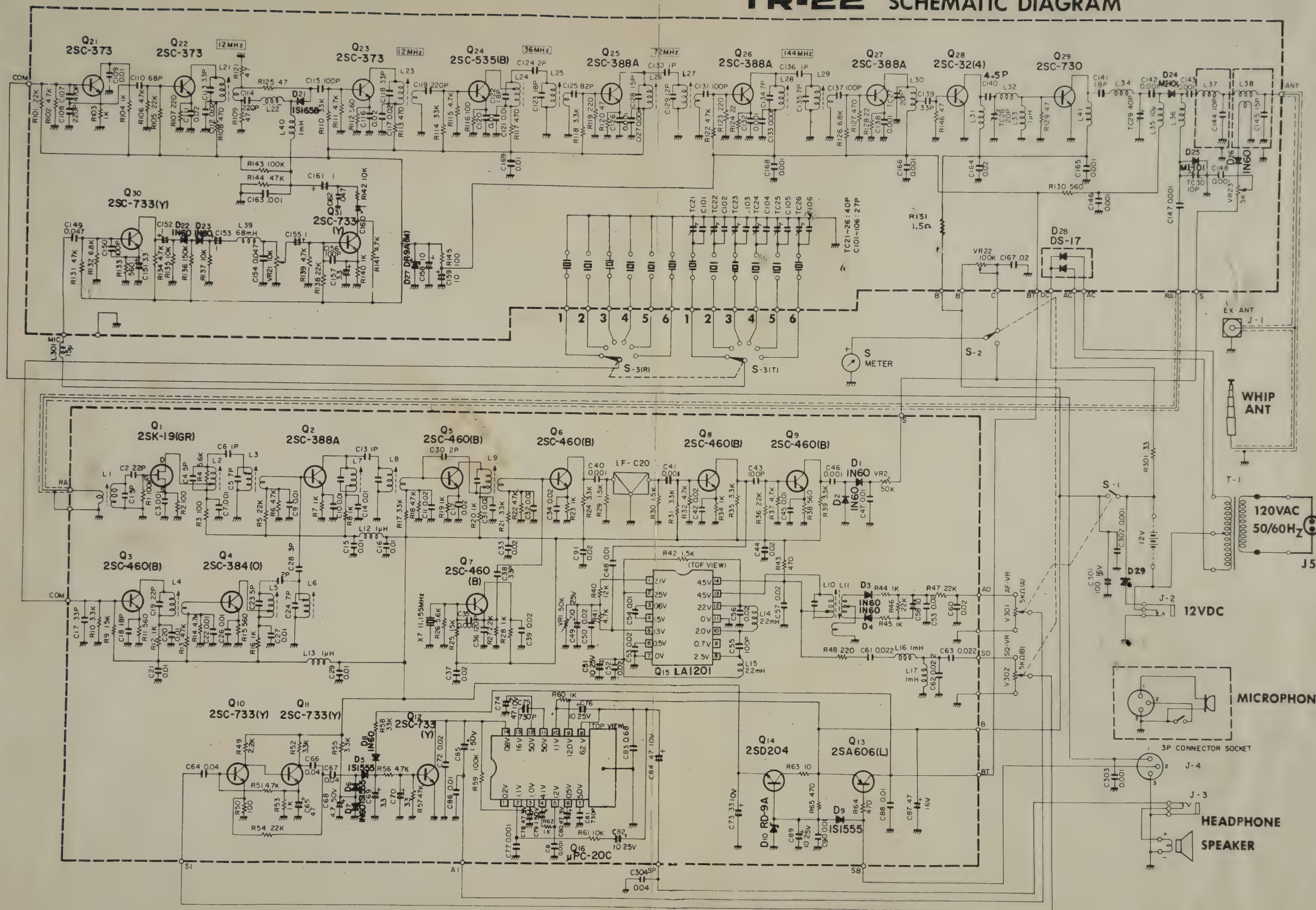
Q1 2SK19(GR), Q2 2SC388(A), Q3 2SC460(B), Q4 2SC384(O), Q5~Q9 2SC460(B)
Q10~Q12 2SC733(Y), Q13 2SA606(L), Q14 2SD204, Q15 LA1201, Q16 μPC-20C
D1~D4 IN60, D5, D6 IS1555, D7, D8 IN60, D9 IS1555, D10 RD9A



$Q_{21} \sim Q_{23}$ 2SC373, Q_{24} 2SC535(B)
$Q_{25} \sim Q_{27}$ 2SC388A Q_{28} 2SC32(4)
Q_{29} 2SC730, Q_{30}, Q_{31} 2SC733(Y)
D_{21} 1S1658, D_{22}, D_{23} 1N60, D_{24}, D_{25} M1101
D_{26} 1N60, D_{27} RD9A(M) D_{28} DS17

HEP-75

TR-22 SCHEMATIC DIAGRAM

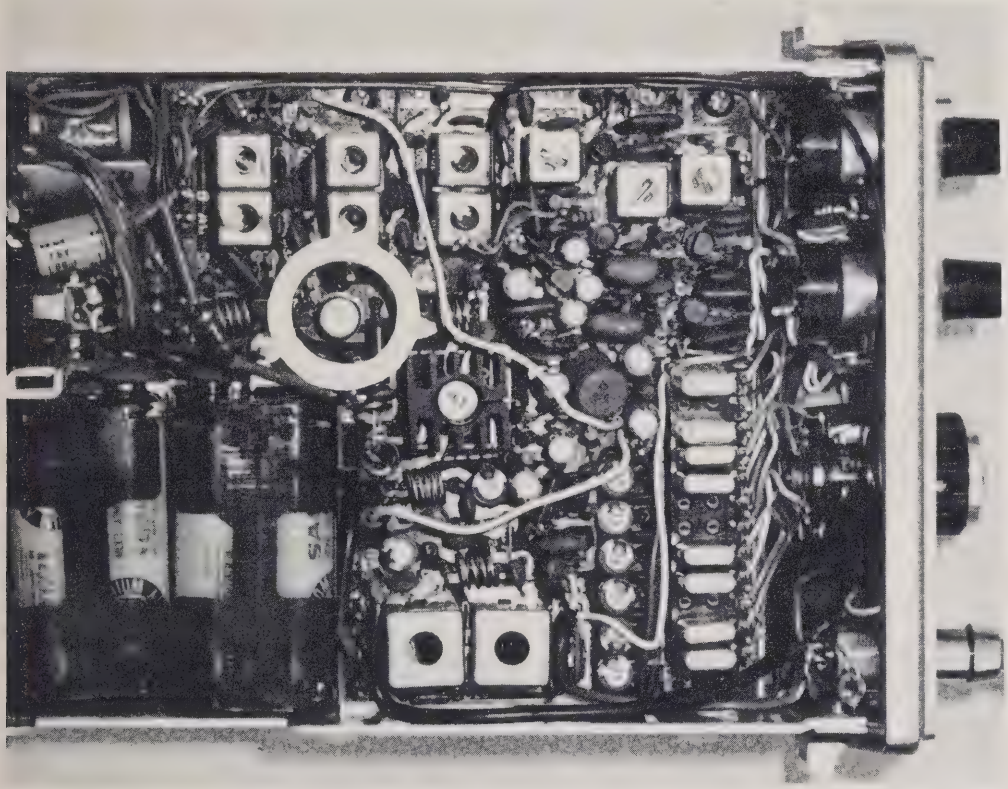


Jerry Copeland W8FJA
32540 Stricker Drive
Warren MI 48093

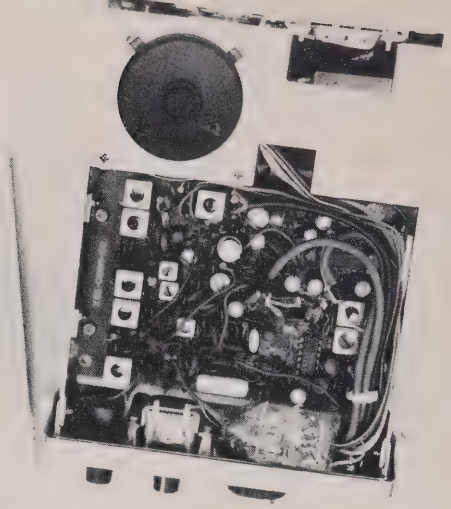
TR-22 MODIFICATION (HIGHER POWER OUTPUT)

One of the most popular 2 meter FM transceivers in use today is the TR-22 from the R.L. Drake Company. Much of its popularity is due to the established reputation for quality of Drake products, but also the versatility of the unit itself. It can be used effectively as a mobile, a portable, and even a base station.

I have used my simplex as far as ten miles, but find that its very best dependability comes working into the repeaters in the Detroit area where I live. As a mobile, I can operate it on the car battery, and with a 5/8 whip, I have no trouble reaching the DART repeater on 04–64 or the GLRA on 16–76 from anywhere in the city or nearby suburbs. But I have also found that with a very simple modification, I could increase its power enough so that it would also hit the same two repeaters when I'm as far as 25 or 30 miles out.



The transistor with the ring around it is the driver (Q28) that we are going to change. To gain access to the foil side of the transmitter board, we turn the rig over and remove the receiver board.



The side of the unit with the speaker has the receiver board. The self-contained antenna has been removed here along with its insulating sleeve, to disclose two mounting screws underneath it. These two screws are removed, along with two more on the left side which are under the wires.

Simple – now, there's a word that I've heard misused quite a bit. I've read some articles where the author used that term with the connotation that meant it was simple if you were an electronic engineer with at least twenty-five years of experience and had $12,000 worth of test equipment at your fingertips to use. But when I define simple, it means that I can do it, and believe me, you can't get any simpler than that. In this case, you replace *one* transistor and peak two coils.

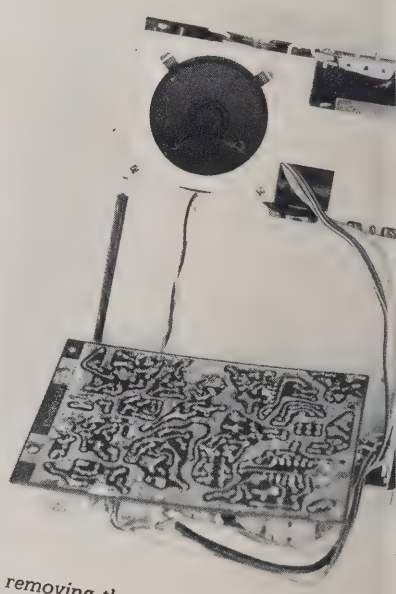
I first heard of the modification from another Detroit area ham, W8FJR (no relation), Roger Moss. He had returned from a vacation trip on the West Coast, and while in the Monterey, California area, he talked with WB6CTA, Jack Lemon, who was using a TR-22 that he had modified to almost double the power output. About two weeks later, I had to make a business trip out there and I talked with Jack a couple of times myself. He reported that he had changed his unit over a year before and had nothing but

good luck with it ev
me, so like Roger, I ci
after I got home.

The driver transisto
a HEP-75 that is avail
then the coils on each
with the help of a Bird
three solder connection
ing, you have increased
1.7 to 2.7W.

I have taken a series c
how little of the rig mus
gain access to the boar
soldering. In compact rig
this is an important cons
don't want to put trouble
messing something up in th
are also photos to show th
ences in output before and a
cation, as well as illustrating
gain almost another ten watts
into an amplifier like the TPL

In the photos, my TR-22 w
little different than the con
which comes from Drake. I h



*After removing the four screws, take off two m
that hold the small right angle brackets to the ri
side of the chassis frame. Carefully lift the recei
board to the right and out. You will now see t
white fiberglass insulating board and the speak
wires.*

since. He co
ged my own

28 is replace
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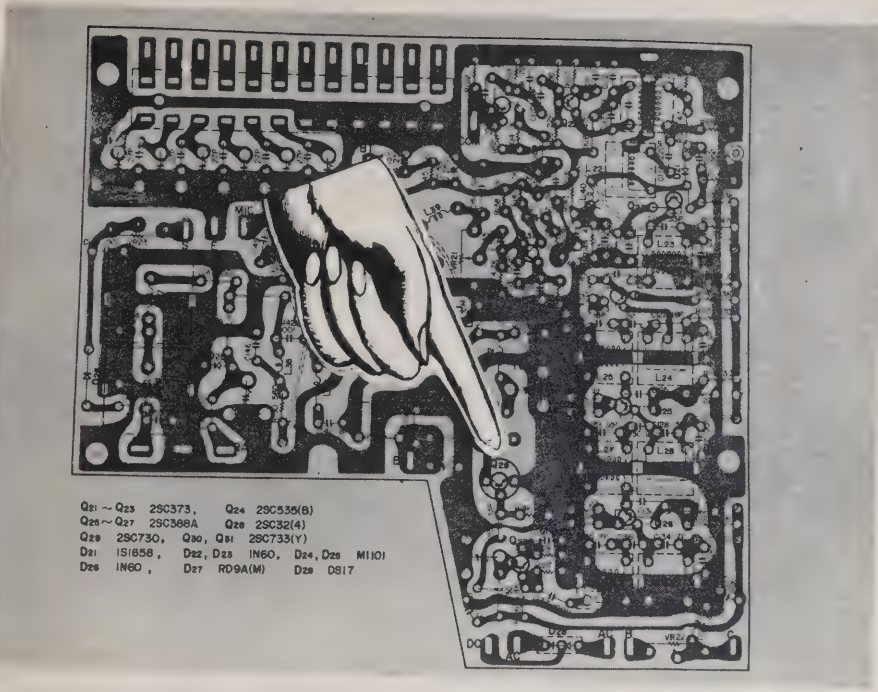
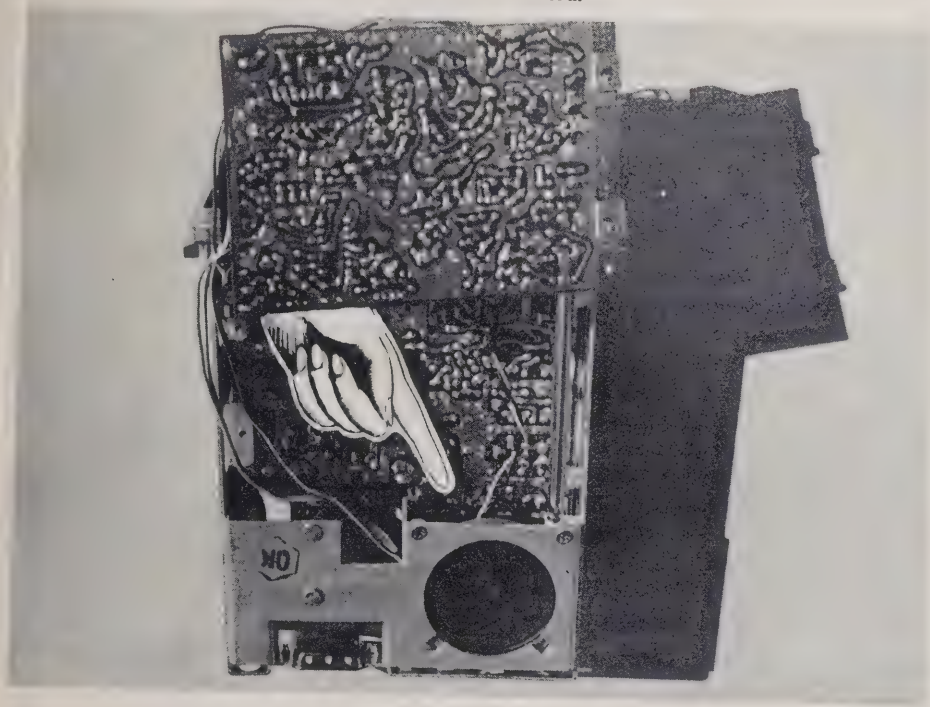
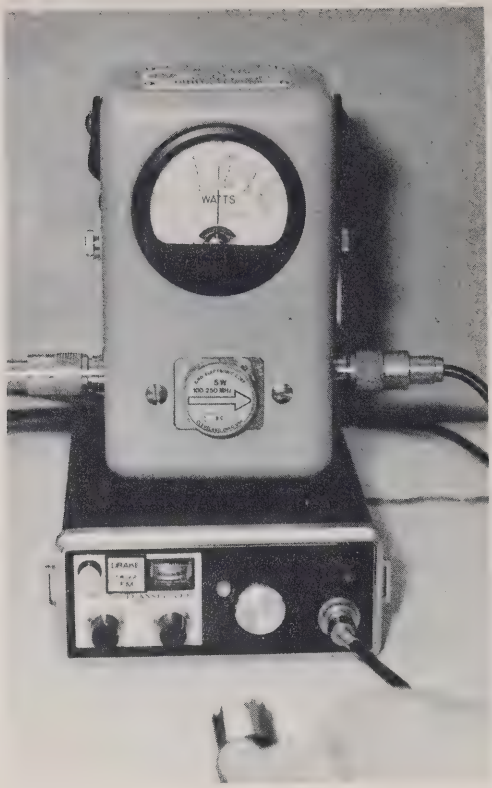


transmitter board is illustrated in the owner's manual with the foil side showing how actual nections are made. Here a circle has been drawn around Q28 to show the three connections where present transistor is removed and the new one substituted.



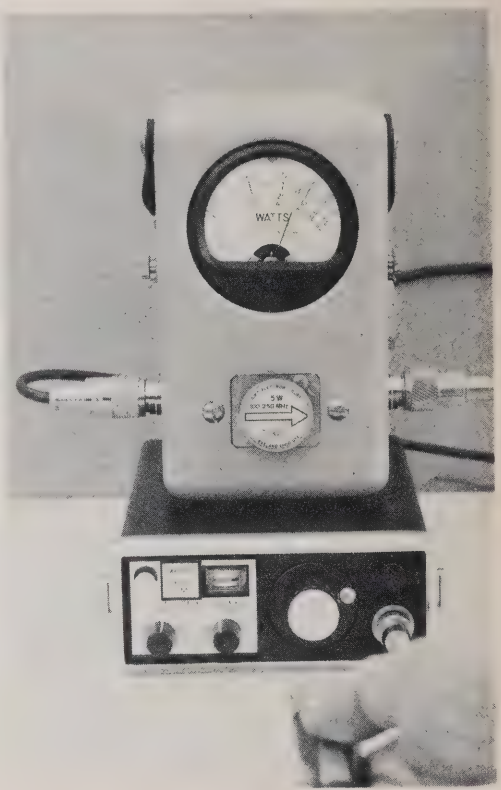
The finger points to the same place on the actual board in the TR-22.



Here an unmodified TR-22 is operated into a dummy load with a Bird Wattmeter showing actual output of 1.7W.

sub-audible tone encoder circuit to it because the two repeaters in the Detroit area require a 100 cycle tone for access. In the plastic bag at the upper right is the miniature circuit board and there are four wires leading from it to the left and down near the speaker to connect to the reed. Part of it can be seen above the ac connector at the bottom of the picture. Those wires also appear in the photo showing the fiberglass insulating board under the receiver board. The only wires seen in a regular set at that point will be the two leading to the speaker.

Even though this is a simple modification to accomplish, some precautions need to be taken to keep from turning it into a very complex project. Extreme care must be taken in the handling and movement of the boards to insure against breaking off any wire connections, and there is one other pitfall to be sure to avoid. Normal time to complete the whole job shouldn't b... to 30 minutes, and the rig does not ha... be moved around much in the ...pess... However, if you lose the screw con...ctor for the built-in antenna, you will have ...arch time recovering it from under the speak...t goes through a terminal and then the p...tic block which is fastened to the side of ...e chassis frame with a screw. You can eit... temporarily remount the antenna after ...e fiberglass board is removed, or just ... careful to not move the rig around so tha... that darned screw does not slide back. I hac... no problem with this in making the modification to my unit, but in taking it apart again to take the pictures for this article, it did get away from me. In recovering it, the terminal broke off and I had to replace the miniature coax and terminal. It was an extra task which could have been avoided by merely keeping the screw that holds the antenna from sliding back.



With all other conditions the same, the modified transceiver output increases to 2.7W.

This photo and the next one show that a higher input to an amplifier like the TPL 502B will yield a higher output. Here the TR-22, as it comes from Drake, will have an output of 42W, with the aid of the TPL.

With the new driver transistor installed, the power from the amplifier increases to about 49W.

Removing the old transistor and soldering in the new one are done in the same manner as routine soldering jobs. Since the transistors fit flush to the circuit boards, there is no room for using clamps to heat sink the connections while soldering. You should have no trouble here providing the iron is applied to each terminal only long enough to make the connection.

The two coils to be peaked are TC-27 and TC-28 and are plainly marked on the board. Alternating back and forth between the two as the Bird meter is watched for its highest output reading will complete the job.

For our tests and photos, I used a regular 12V automotive battery for the power source, and had the car engine running at fast idle to insure maximum voltage and current available. While it is best to show examples like this in terms of maximums, it should be remembered that the real benefits to raising power output in small amounts is in the lowest ranges, or when operating portable on the self-contained nicads.

There are several Class C amplifiers available to use with the smaller rigs like the TR-22. Drake offers their own AA-22 for 25W out, and the AA-10 for 10W. If you make this modification, you will *not* be able to use the new amp as it has a fixed input to match the TR-22s as they come from the factory. It should also be borne in mind that if your rig is less than 90 days old and therefore still under warranty, it would not be wise to make this or any other modification. No matter what you buy today, the warranty will be void when any unauthorized repairs or modifications are made to the product.

Battery life of the nicads is shortened by the increased output as it naturally takes more power. While this is difficult to measure, it has been estimated by my use – and some others that I know who have done theirs – to be approximately 25% less. For anyone who would find this to be confining to their operation, the original nicads could be replaced with some 500 mil nicads and this would increase the battery life by about 10%.

If you own a TR-22, the decision to make the modification should be made based on your own particular type of operation. For portable and mobile use barefooted, it almost doubles your effective range. If you work into a variable input amplifier, your increase will be in the vicinity of 16 to 20%. My own experience has proven it to be worthwhile, and in the six months since I have done it, I have found no reason to wish that I had not made the modification.

. . .W8FJA

INOUE COMES TO ADIRONDACK RADIO SUPPLY, INC.

T. Inoue, President of INOUE Communication Equipment Corp., of Osaka, Japan, and Don Specht, export manager of the same firm, are showing Howard Hinkle, President of Adirondack Radio Supply, some of the many features of the incomparable **INOUE IC-21** 2 meter FM transceiver.

Today why not check personally the many exciting features the IC-21 offers, such as:

● 24 channel capability ● Front panel — P.A. tune control ● Separate S and discriminator meters ● R.I.T. control on receive (either one watt or ten watt output) ● Remote VFO plug ● 12 Volt DC or 110 Volt AC operation ● Crystals supplied in 4 channels ● AC/DC cable supply

These and many other features are part of the INOUE IC-21 imported by us directly.
Shown below is the latest addition to the INOUE line, the IC-21 receiving VFO. It plugs directly into the IC-21. This combination we are offering at a SPECIAL INTRODUCTORY PRICE. These two units can be purchased at only **$450.00**. This is a saving of $59.00 over the single lot price of $399.50 for the IC-21 and $109.50 for the IC-21 VFO.

$450

Send your order today to the address below or see the INOUE line at your favorite dealer.

ADIRONDACK RADIO SUPPLY, INC.
185 West Main St. Amsterdam, New York 12010

INSTALLING NEW HEP-75 TRANSISTOR IN THE DRAKE TR-22

1. Extreme care must be taken in the handling and movement of the boards to insure against breaking off any wire connections.

2. Remove self contained antenna. NOTE - Be careful not to lose the screw connection for the antenna.

3. Remove two mounting screws under the antenna.

4. Remove two mounting screws under the wires on the lift side.

5. After removing the four screws, take off two more that hold the small right angle bracket to the right side of the chassis frame.

6. Carefully lift the receiver board to the right and out.

7. NOTE - You will now see the white fiberglass insulating board and speaker wires.

8. Temporarily remount the antenna wires after fiberglass board is removed.

9. Unsolder and remove old transistor and install the new one. Transistor mounts flush to circuit board.

10. Reassemble unit.

11. Peak two coils TC-27 and TC-28, alternating back and forth between the two as the Watt meter is watched for it's highest output reading.

Job Completed

INSTRUCTIONS FOR THE TEMPO CT-252-A-2

INTRODUCTION

Tempo and CT offer the finest amateur RF amplifiers for VHF FM available on the market today. Years of experience in solid state RF design have gone into the amplifiers to assure the highest degree of efficiency and reliability. All components have been chosen because of their reliability and performance. The power transistors have been selected from leading American manufacturers. Still with these quality components, this amplifier is economically and competitively priced because of the advanced techniques employed in its design and manufacture. With proper care, your amplifier will offer a lifetime of dependable service.

INSTALLATION INSTRUCTIONS

Before installing the amplifier, check it for visible damage. If there is damage, return the amplifier to your dealer immediately. The solid state devices in the amplifier may be damaged if the unit is operated in a damaged condition. Also please return the warranty card to Henry Radio within 10 days of purchase.

The amplifier comes complete with all of the necessary installation cables. The power cable should be connected directly across the battery terminals to minimize ignition starting spikes and to prevent damage to the ignition switch from the high current drain of the amplifier.

The red wire must be connected to the positive terminal and the black wire to the negative terminal. The amplifier is designed for use only on vehicles with negative ground. A special version of all amplifiers is available for use on vehicles with positive ground.

After the power connections are made, plug the antenna into the coax connector (RF OUT) of the amplifier. Then connect the RF input cable to the RF IN jack. All of the amplifiers come pretuned from the factory. However, if your SWR is more than 1.5:1, or if you are operating at a frequency not between 144 and 148 MHz, refer to the tune-up instructions begore operating the amplifier.

Some exciters are very sensitive to different loads. Therefore if the power output is not what it should be, or if the relay chatters, refer to the tune-up instructions.

TUNE-UP INSTRUCTIONS

To properly tune the amplifier, the following equipment is necessary. A thru-line wattmeter - an insulated tuning tool (no metal tip) - a VOM - a regulated power supply for bench testing (adjustable) - and a 50 ohm dummy load.

During initial tuning the power supply should be set at no higher than 11 volts. If the amplifier is tuned in a vehicle, the engine should not be running.

Tune the Arco 403 and the Arco 404 at the RF INPUT jack for minimum reflected power, as indicated on the thru-line wattmeter. Adjust the Arco 404 located in the center of the printed circuit board for maximum output power on the wattmeter. Then tune the two Arco 404s in the output for maximum output power on the wattmeter. Repeat these steps until the minimum reflected power and maximum output power occur simultaniously. (L5, L6, L7, C8, C10, C11, C12, and C13 are found only in the commercial amplifiers)

CIRCUIT DESCRIPTION

The amplifier has an RF sensing circuit to provide automatic antenna switching and two RF amplifying stages to operate Class C.

The incoming RF from the exciter is sensed by diode CR1 and the rectified output of the diode biases Q1 into conduction, energizing the relay, K1. With K1 energized, the incoming RF is switched to the input of the amplifier. The 50 ohm input line is matched to the input of the driver transistor by a Pi network. The stage operates as a class C amplifier due to the inherent rectifying action of the base-emitter junction, allowing about 160 degrees of the incoming wave to bias the stage on. The output of the driver stage is matched to the input of the final stage by an L network with the final stage operating just like the driver stage. The output of the final is then matched to the load by an L network.

The commercial version of this amplifier has a Pi L filter in the output line and is AC coupled to the antenna by a 1500 pf capacitor to eliminate the possibility of DC reaching the antenna from external keying circuits.

WARRANTY

Henry Radio warrants each new radio product sold by it to be free from defective workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit of its sale which under normal installation, use, and service discloses such defect, provided the unit is delivered by the owner to us intact, for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to the original purchaser and provided that such examination discloses in our judgment that it is defective. Should a malfunction be suspected, write in detail to our service department for suggestions concerning the operation, repair, or return of your unit, if it should prove necessary.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor does it extend to units which have been repaired or altered outside our service department, nor in cases where the serial number has been removed, defaced, or changed, nor to units used with accessories not manufactured or recommended by us.

Any part of a unit approved for remedy or exchange hereunder will be exchanged by Henry Radio without charge to the owner.

Henry Radio

11240 West Olympic Blvd. Los Angeles, Calif. 90064 213/272-0861

CT-252-A-2 PARTS LIST

C1	CAPACITOR: .01 mf.
C2	CAPACITOR: 110 pf.
C3	CAPACITOR: .01 mf.
C4	CAPACITOR: 56 pf.
C5	CAPACITOR: 1 mf.
C6	CAPACITOR: .01 mf.
C7	CAPACITOR: .001 mf.
C8	CAPACITOR: 20 pf.
C9	CAPACITOR: .001 mf.
C10	CAPACITOR: 35 pf.
C11	CAPACITOR: 35 pf.
C12	CAPACITOR: 20 pf.
C13	CAPACITOR: 1500 pf.

All variable capacitors are Arco 400 series.

CR1 DIODE: 1N34.

FBC CHOKE: Farreta bead.

K1 RELAY: 12 VDC, 2PDT.

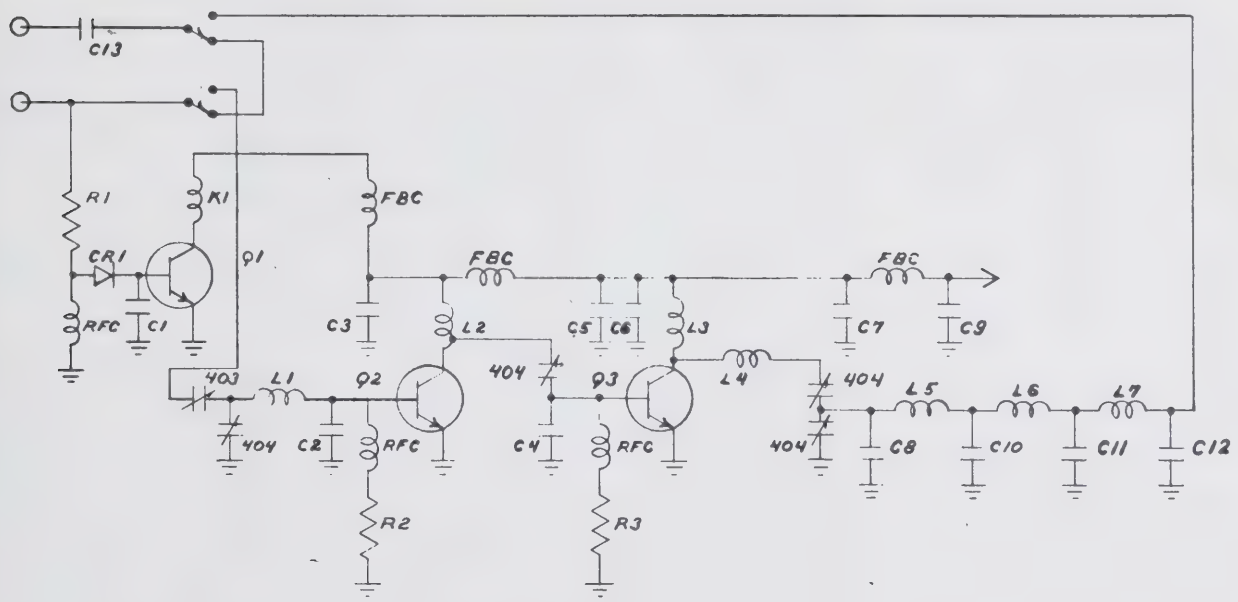
L1 to L7 COIL: Available from the manufacturer.

Q1	TRANSISTOR: 2N2222.
Q2	TRANSISTOR: PT 3503.
Q3	TRANSISTOR: PT 5649.

R1	RESISTOR: 1 K ohm.
R2	RESISTOR: 10 ohm.
R3	RESISTOR: 2.7 ohm.

RFC CHOKE: 2.7 uh.

CT-252-A-2 SCHEMATIC

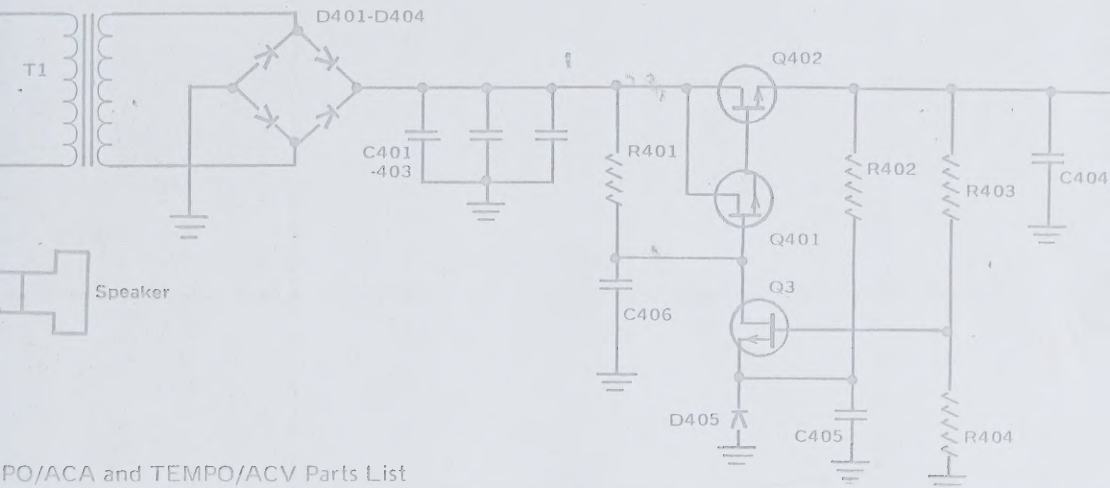


SPECIFICATIONS

DRIVE POWER:	1 watt	OUTPUT POWER:	25 watts
VOLTAGE:	13.8 VDC	CURRENT:	4 amps

e power supplies are designed for use with Tempo FM transceivers. The ACA delivers 13.8 VD
a 115 VAC power source with a current capacity of 4 amperes. The ACV delivers 13.8 VD
a 115 VAC power source with a current capacity of 2 amperes.

EMATIC



PO/ACA and TEMPO/ACV Parts List

matic No.	Description	ACA No.	AC
through C404	CAPACITOR: Electrolytic, 500 mf, 50 volt.	08 01390	Sa
	CAPACITOR: Electrolytic, 25 mf, 30 volt.	08 05025	Sa
	CAPACITOR: Electrolytic, 2 mf, 30 volt.	08 03051	Sa
net	Top	48 20200	Sa
net	Bottom	48 20201	Sa
through D404	DIODE: Auto diode, 150 volt, 20 amp.	73 00100	Sa
	DIODE: Zener, 10 volt, 1 watt.	73 14740	Sa
	FUSE: 3 AG, 1 amp, 250 volt.	24 30101	Sa
	FUSE: 3 AG, 5 amp (ACV is 2 amp), 250 volt.	24 30150	24
	Black plastic.	36 00103	Sa
holder	3 AG fuse holder.	25 34204	Sa
Sink		48 20600	Sa
r Cord	AC power cord.	04 00100	Sa
	PLUG: Speaker, mini phono plug.	16 90001	Sa
	PLUG: Power, plastic, 2 connector, 10 amp.	16 00002	16
	TRANSISTOR: Silicon, medium power, NPN, 60 v, 3 amp.	72 00243	Sa
	TRANSISTOR: Same as Q3.	72 00243	Sa
	TRANSISTOR: Silicon, high power, NPN, 70 v, 10 amp.	72 00247	Sa
	RESISTOR: Carbon, 4.7 K ohm, ½ watt, 10%.	68 40472	Sa
	RESISTOR: Carbon, 560 ohm, ½ watt, 10%.	68 45600	Sa
	RESISTOR: Carbon, 820 ohm, ½ watt, 10%.	68 48200	Sa
	RESISTOR: Carbon, 2.2 K ohm, ½ watt, 10%.	68 40222	Sa
ker	3" x 5", 3.2 ohm, 5 watts.	56 00103	Sa
	TRANSFORMER: Primary- 115 VAC, Secondary- 25.2 volt, 3 amp (1.5 amp for ACV), 2500 volt test.	84 21114	84

4.6?

TRANS

5 = 146.76

3 = 146.34

2, 1 = 146.84

SO

145.07